Sample Proficiency Standards

What follows is a sample activity used in one school to assess the level of proficiency of students in several performance standards contained in the Wisconsin Model Academic Standards for Technology Education. This same activity can be used to assess the level of proficiency in the performance standards of other disciplines. These have been referenced, but actual proficiency standards have not been included here.

Content And Performance Standards Addressed

B. Systems

Content Standard
Students in Wisconsin will recognize that systems are made up of individual components and that each component affects the operation of the system and its relationship to other systems.

Performance Standards
- B.12.2 Demonstrate how systems are planned, organized, designed, built, and controlled
- B.12.4 Illustrate how resources are essential to technological activity but that their availability and quality vary extensively throughout the world
- B.12.6 Show how new knowledge is usually, by design or otherwise, an outcome of technological activity that contributes to the exponential growth of technological knowledge
- B.12.7 Explain how new and higher quality products require new and higher quality materials and processing techniques
- B.12.8 Select and apply appropriate processes to transform information into its most useful format

C. Human Ingenuity

Content Standard
Students in Wisconsin will be able to define problems, gather information, explore options, devise a solution, evaluate the outcome, and communicate the results.

Performance Standards
- C.12.1 Implement and evaluate strategies to solve technological problems that are likely to be successful
- C.12.2 Measure, collect, and analyze data in order to solve a technological problem
- C.12.3 Defend solutions to technological problems and opportunities
- C.12.4 Select materials and other resources for a technological design and develop practical solutions
- C.12.5 Identify constraints present in a given technological process
- C.12.6 Design and/or create solutions that are functional, aesthetically pleasing, demonstrate quality, have value greater than the investment, and meet a societal want or need
- C.12.7 Present a design solution that accounts for production of a device; how the device would be operated, maintained, replaced, and disposed of; and, who will sell and manage it
- C.12.8 Know that design solutions may have effects that were not predicted
- C.12.9 Apply basic engineering concepts in the design and creation of solutions to various problems or opportunities
- C.12.10 Evaluate a technological solution and make necessary improvement if needed
- C.12.11 Select and apply appropriate processes to alter the characteristics of material to make it useful in different situations

Examples of Other Standards Addressed by This Activity

English Language Arts

A.12.4 Read to acquire information

- *Apply tests of logic and reasoning to informational and persuasive texts*
- *Analyze and synthesize the concepts and details encountered in informational texts such as reports, technical manuals, historical papers, and government documents*
- *Draw on and integrate information from multiple sources when acquiring knowledge and developing a position on a topic of interest*
- *Evaluate the reliability and authenticity of information conveyed in a text, using criteria based on knowledge of the author, topic, and context and analysis of logic, evidence, propaganda, and language*

B.12.1 Create or produce writing to communicate with different audiences for a variety of purposes

- *Prepare and publish technical writing such as memos, applications, letters, reports and resumes for various audiences, attending to details of layout and format as appropriate to purpose*
- *Use a variety of writing technologies, including pen and paper as well as computers*
- *Write for a variety of readers, including peers, teachers, and other adults, adapting content, style, and structure to audience and situation*

E.12.1 Use computers to acquire, organize, analyze, and communicate information

- *Design, format, and produce attractive word-processed documents for various purposes*
- *Integrate graphics appropriately into reports, newsletters, and other documents*
- *Use on-line sources to exchange information*

F.12.1 Conduct research and inquiry on self-selected or assigned topics, issues, or problems and use an appropriate form to communicate their findings

- *Formulate questions addressing issues or problems that can be answered through a well-defined and focused investigation*
- *Develop research strategies appropriate to the investigation, considering methods such as questionnaires, experiments, and field studies*
- *Organize research materials and data, maintaining a note-taking system that includes summary, paraphrase, and quoted material*
- *Evaluate the usefulness and credibility of data and sources by applying tests of evidence, including bias, position, expertise, adequacy, validity, reliability, and date*
- *Analyze, synthesize, and integrate data, drafting a reasoned report that supports and appropriately illustrates inferences and conclusions drawn from research*

Math

A.12.1 Use reason and logic to

- *evaluate information*
- *perceive patterns*
- *identify relationships*
- *formulate questions, pose problems, and make and test conjectures*
- *pursue ideas that lead to further understanding and deeper insight*

A.12.3 Analyze nonroutine problems and arrive at solutions by various means, including models and simulations, often starting with provisional conjectures and progressing, directly or indirectly, to a solution, justification, or counter-example

B.12.5 Create and critically evaluate numerical arguments presented in a variety of classroom and real-world situations (e.g., political, economic, scientific, social)

B.12.6 Routinely assess the acceptable limits of error when

- *evaluating strategies*
- *testing the reasonableness of results*
- *using technology to carry out computations*

C.12.1 Identify, describe, and analyze properties of figures, relationships among figures, and relationships among their parts by

- *Constructing physical models*
- *Drawing precisely with paper and pencil, hand calculators, and computer software*
- *Using appropriate transformations (e.g., Translations, rotations, reflections, enlargements)*
- *Using reason and logic*

C.12.2 Use geometric models to solve mathematical and real-world problems

C.12.4 Use the two-dimensional rectangular coordinate system and algebraic procedures to describe and characterize geometric properties and relationships such as slope, intercepts, parallelism, and perpendicularity

C.12.5 Identify and demonstrate an understanding of the three ratios used in right-triangle trigonometry (sine, cosine, tangent)

D.12.1 Identify, describe, and use derived attributes (e.g., density, speed, acceleration, pressure) to represent and solve problem situations

D.12.2 Select and use tools with appropriate degree of precision to determine measurements directly within specified degrees of accuracy and error (tolerance)

D.12.3 Determine measurements indirectly, using

- *Estimation*
- *Proportional reasoning, including those involving squaring and cubing (e.g., Reasoning that areas of circles are proportional to the squares of their radii)*
- *Techniques of algebra, geometry, and right triangle trigonometry*
- *Formulas in applications (e.g., For compound interest, distance formula)*
- *Geometric formulas to derive lengths, areas, or volumes of shapes and objects (e.g., Cones, parallelograms, cylinders, pyramids)*
- *Geometric relationships and properties of circles and polygons (e.g., Size of central angles, area of a sector of a circle)*
- *Conversion constants to relate measures in one system to another (e.g., Meters to feet, dollars to deutschmarks)*

E.12.5 Determine the likelihood of occurrence of complex events by

- *Using a variety of strategies (e.g., Combinations) to identify possible outcomes*
- *Conducting an experiment*
- *Designing and conducting simulations*
- *Applying theoretical probability*

Science

A.12.3 Give examples that show how partial systems, models, and explanations are used to give quick and reasonable solutions that are accurate enough for basic needs

A.12.5 Show how the ideas and themes of science can be used to make real-life decisions about careers, work places, life-styles, and use of resources

B.12.4 Show how basic research and applied research contribute to new discoveries, inventions, and applications

B.12.5 Explain how science is based on assumptions about the natural world and themes that describe the natural world

G.12.2 Design, build, evaluate, and revise models and explanations related to the earth and space, life and environmental, and physical sciences

C.12.3 Evaluate the data collected during an investigation, critique the data-collection procedures and results, and suggest ways to make any needed improvements

D.12.5 Identify patterns in chemical and physical properties and use them to predict likely chemical and physical changes and interactions

D.12.7 Qualitatively and quantitatively analyze changes in the motion of objects and the forces that act on them and represent analytical data both algebraically and graphically

E.12.4 Analyze the benefits, costs, and limitations of past, present, and projected use of resources and technology and explain the consequences to the environment

G.12.3 Analyze the costs, benefits, or problems resulting from a scientific or technological innovation, including implications for the individual and the community

H.12.5 Investigate how current plans or proposals concerning resource management, scientific knowledge, or technological development will have an impact on the environment, ecology, and quality of life in a community or region

Sample Activity

What follows is a copy of an actual activity packet used by Monona Grove High School. The activity is completed by students in certain technology education classes to assess their ability to apply a variety of technology skills and knowledge related to the state standards. If some of the images are not completely clear, it is because they were scanned from one of the activity packets. The materials are being shown here with permission from the instructors at Monona Grove High School.

PROBLEM-SOLVING
Design Portfolio

Team Name:_____

Team Members:

_____

_____

_____

_____

Project Statement: To design and prototype a self powered vehicle which will travel a distance of five feet, stop six inches from the first container, and eject a whiffle ball which is to reside in one of a series of six containers.

Guidelines:

* No remote control vehicles allowed.
* The vehicle size may not exceed 12" x 12"
* Once set into motion, the vehicle may not be succumbed to human intervention.
* Any item deemed hazardous or unfit for use by any instructor may not be used.
* The evaluation set may not be altered for use with your vehicle.
* Each team is limited to $10.00 for any materials purchased (receipts required!).
* The vehicle must be designed and manufactured by the project team.

Requirements:

Each group will:

* maintain a daily log of each day's activities. (It is suggested that you obtain a small notebook to log your accounts in.)

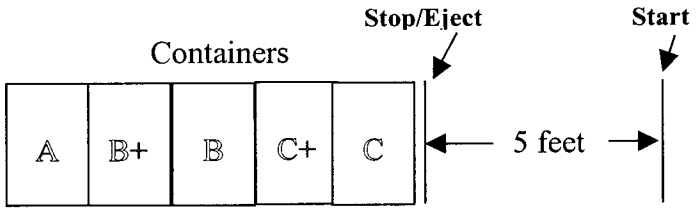
* complete a portfolio which fully documents the design and problem solving process.

* provide drawing in three views (top, side, and front) to be included in your portfolio.

* create a computer generated graphic or logo to be displayed on their vehicle.

Evaluation of Vehicle:

- All of the above requirements must be satisfied before the final evaluation. Your final grade will be dependent on the successful operation of your group's vehicle.
- The evaluation set will appear as in the diagram below. The containers which will accept the whiffle ball measure 17"(w) x 11(d) x 13"(h).



- To earn a "C" on your vehicle, the ball must land in the "C" Container; to earn a "B+", the ball must land in the "B+" container; etc.
- Upon completion of vehicle testing, your group's portfolio, daily log, and prototype will be turned in for evaluation.

Evaluation of portfolio, daily log, and prototype:

- Your portfolio, daily log, and prototype will be evaluated based on your demonstration of meeting the appropriate standards. Each section of the portfolio will be given a rating of Advanced, Proficient, Partially Proficient, or Minimal.
- The following rating scale will be used:
  - Advanced – Students demonstrated a clear understanding of the appropriate standard by applying the underlying concepts in original and creative ways.
  - Proficient – Students demonstrated an understanding of the appropriate standard by applying the underlying concepts in a fairly traditional and expected manner.
  - Partially Proficient – Students demonstrated an understanding of some aspects of the appropriate standard, but could not consistently apply the underlying concepts.
  - Minimal – Students made an attempt to complete the assigned activities, but demonstrated very little or no understanding of the underlying concepts.

STEP 1

Define the Problem

NOTES

Describe the problem:

Problem-Solving Steps

1. Define the problem.
2. Identify the resources.
3. Brainstorm possible solutions.
4. Select the best solution.
5. Implement the solution.
6. Test the solution.
7. Evaluate the solution.

1-Minute Brainstorm

What are the restrictions or parameters for this activity?

In order to be successful, what goals must the solution meet?

STEP 2

Identify The Resources

NOTES

Identify the resources that will be used to solve this problem.

Time:

Tools & Equipment:

Capital:

Power Source:

Materials:

People:

Information:

What other materials or past projects could be incorporated into this project?

Describe one thing you learned in a past activity that helped you during this activity.

1-Minute Brainstorm
Where will the resources come from?

STEP 3

Brainstorm Ideas

NOTES

On this page and the next, write about and sketch possible solutions.

STEP 4

Choose The Best Solution

NOTES

Explain why this design was chosen as the best solution to the problem.

What materials will be needed?

On the next page, draw the final design.

STEP 5

Implementation

NOTES

List the steps needed to construct the prototype:

List any team members and their jobs:

STEP 6

Test The Solution

How will you know if the prototype is an effective solution to the problem?

Describe how the prototype will be tested:

After testing the prototype, what were the results?

What changes (if any) were needed to get the prototype to work successfully?

STEP 7

Evaluation

Describe the prototype and what it does:

Is the prototype successful? Why or why not?

How does the prototype differ from the final drawing?

What did you like and/or dislike about the prototype?

Self-Assessment

NOTES

Was there any part of the problem that you did not understand?

What part of the design problem was easiest to solve?

What part of the design problem was the most difficult to solve?

NOTES

What was the most important thing you learned from this activity?

Did the finished prototype meet your expectations? Explain.

Was the prototype successful? Explain.

Rate yourself: